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SELF-RELIANCE— A SCIENTIFIC ANALYSIS*

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THE concept of self-reliance is multidimensional and is associated with multiple objectives. The precise link between self-reliance and technological development is hard to define and still remains a vague concept. As defined in para 2.2 of the Technology Policy Statement (TPS), "*self-reliance is inescapable and must be at the very heart of technological development.*" The TPS further states that "*we must aim at major technological breakthrough in the shortest possible time for the development of indigenous technology appropriate to national priorities and needs.*" Thus the TPS stipulates an innovative technology of an international standard to take care of our national priorities.

For a country of India's size, self-reliance is of paramount importance because of our past history. Our colonial past has deprived us from the impact of industrial revolution of Europe of 1780-1830. Though India is the tenth industrial nation, unemployment and illiteracy still plague us. We produce goods without any quality control and continue to export raw materials like iron ore and agricultural raw materials. Finished products constitute a small fraction of our exports. We entered the industrial revolution at a stage when the developed countries have gone ahead of us by leaps and bounds and the rate of their industrial growth is so enormous that it will not wait for us to catch up. Self-reliance is also important for our survival and the preservation of our independence. Our history tells us that we had been vulnerable in the past for the invaders. In a world of geophysical tension with increased sophisticated arms in the possession of our neighbours, technological self-reliance in defence becomes our most vital national need. We also need self-reliance for the improvement of the quality of life of our people.

I would now try to analyse the various parameters of self-reliance needed for our technological base and technological "breakthroughs" as envisaged in TPS. The technological base is a very important parameter for

self-reliance. The basic and applied sciences are the two pillars of the technological base. Technological breakthroughs are possible only when our basic sciences are of international level. In our endeavour to create new knowledge, we should strive at the quality of excellence as judged by the quality of papers at an international level. Unfortunately, we have accepted a zero value system for our basic sciences and have tolerated increased mediocrity in due course. We believe in "isolated science" in India to an extent that we have closed our eyes for subjective judgement. Basic sciences are international and they cannot remain an isolated adiabatic system with no interaction with the outside world. We have to be ruthless in our own judgement and excellence has to be translated and practised in our universities which are centres for our "basic sciences". The recently misused scheme of promotion in the universities may perhaps cause an enormous damage to our scientific base and should be checked and corrected. Rewards and incentives for excellence should be very clearly defined and the maximum utilization of talents attempted. Without basic knowledge there cannot be any self-reliance.

In contrast to basic sciences, applied sciences are directly related to industrial activity. When the basic knowledge acquired in a university or laboratory is translated to a process knowhow, it is kept secretive and we have to pay for the information. Unlike the open-ended basic research, applied research should have economic feasibility and should be time-targetted. The quality of applied sciences is directly proportional to the quality of basic research inputs. The agencies indentified for applied research are CSIR, ICAR, ICMR and the R & D in government supported laboratories. Approximately 10% of the applied research is also contributed by private sector. As there is a thin line of demarcation between basic and applied research, no agency can afford to sustain excellence in applied research unless its basic research base is strengthened. Thus there is a need for at least 30 per cent of the time of an agency laboratory to be spent in selected problems of basic research chosen to strengthen the applied research base. There is also a need for close collaboration in terms of exchange of scientific knowledge and information between the university system and the ency laboratories to strengthen the technology base. In order to achieve excellence, laboratories should work in a well-defined newly emerging frontier areas and select problems, possibly of a multidisciplinary nature, to involve universities and other agencies. Non-innovative scientific programmes should be stopped to avoid a thin spreading of resources.

*Address delivered at the INSA-Industry Interaction workshop on January 30, 1984 at Bhavnagar, Gujarat.

Most of the CSIR laboratories have knowhow upto the pilot plant stage so that large industries are reluctant to take the indigenous technology from the CSIR laboratories. The CSIR knowhow has mostly served the smaller sector, the big industries still prefer to import technology from abroad. Therefore, there is a need for CSIR laboratories to select a few technologies in key areas and take them to the full industrial production stage. The CSIR is already thinking of such complexes in the fertilizer and coal sector in the seventh Five Year Plan. This venture will gain the confidence of big industry in the indigenous knowhow and will help to close the growing gap between CSIR laboratories and industry. This gap has unfortunately hampered the adoption of indigenous technology and has to be bridged.

Import of Technology

Self-reliance in its spirit does not mean a system where the industry in the country is a watertight compartment with a self-contained industrial chain extending over design, fabrication, and commissioning with no external inputs. In an era where the technology is expanding with an electronic speed such a system will rapidly lead to obsolescence. As stated in para 5 of TPS, "*A policy directed towards technological self-reliance does not imply technological self-sufficiency. The criterion should be national interest.*" Advantage should be taken of technological development elsewhere. This can also be achieved through a well-defined collaborative arrangement in research and development. Thus there is a provision in TPS of a mix-up of indigenous and imported technology. Whereas a total design can be indigenously fabricated, the sophisticated components and subsystems can be acquired from friendly countries where the production techniques for these components are well established and understood. This will definitely reduce the time gap in the acquisition of indigenous knowhow and reduce obsolescence. There is a danger, however, in the import of a total knowhow from abroad. In most of the cases, the foreign collaborator passes on the knowhow which is a generation older than the latest knowhow prevailing in the country. Though in strategic areas such a knowhow is of no value, but in other commercial areas however, an outdated knowhow in a developed country may be still be innovative in a developing country. An open licence policy for the import of foreign technology nonexistent in the country may induce a certain degree of healthy competition in industry and stop the growing obsolescence.

A primary reason for the obsolescence in industry is the excessive protection given to industry. In the earlier stages it was necessary but in terms of growth it has hampered progress. The extent to which a technology has to be imported depends on the needs of the country and the balance of payment consideration. A positive aspect of the imported technology would be the cost reduction and a quantum jump in technology in terms of modern sophistication.

It must nevertheless, be explicitly understood that the definition of knowhow for a foreign collaborator is the transfer of manufacturing drawings and in many cases provision of special machinery and the necessary equipment to obtain the product. Critical design calculations are seldom provided by the collaborator and the knowwhy of the process still remains unanswered. The knowhow thus becomes in effect the transfer of equipment, though the local collaborator is assured of his product, the profit and a foreign market, the innovative pursuits in the search of knowwhy is lost. As a consequence, when the process is improved he has to again contact the collaborator for the knowhow and try for fresh import. Thus, the foreign collaborator permanently captures the ground in the developing country by hampering the quest for knowwhy and technological self-reliance.

We started importing complete technological knowhow for heavy industries in the first two plans. In the operation of these industries, the total system came from outside and we only learnt how to run a plant. There was no subsequent attempt for the absorption of technology which resulted in a certain degree of obsolescence of our heavy industries. In the import of technology, para 5.2 says "*the technology import will be so planned as to have effective transfer of basic knowledge (knowwhy) and to facilitate further advancements.*" Thus the knowwhy and the absorption of technology conjured should be a prerequisite for the import of technology. A certain percentage of capital should be spent on in-house which will help in the absorption of technology and check obsolescence. We have to learn lessons from Japan that had perfected the absorption of imported technology in the earlier stages to an extent that their technologies are now internationally competitive.

One of the ways suggested for the absorption of technologies is "reverse technology or engineering" which is the name adopted for the unpacking of technology and copying. This is in fact a time-consuming process. By the time the machine or technology is copied it would have already become

obsolete. Further, the unpacking of technology is not always easier since the manufacture has hidden in-built parameters that cannot be "unpacked". Thus, very little knowhow transfer or knowwhy is achieved by this process.

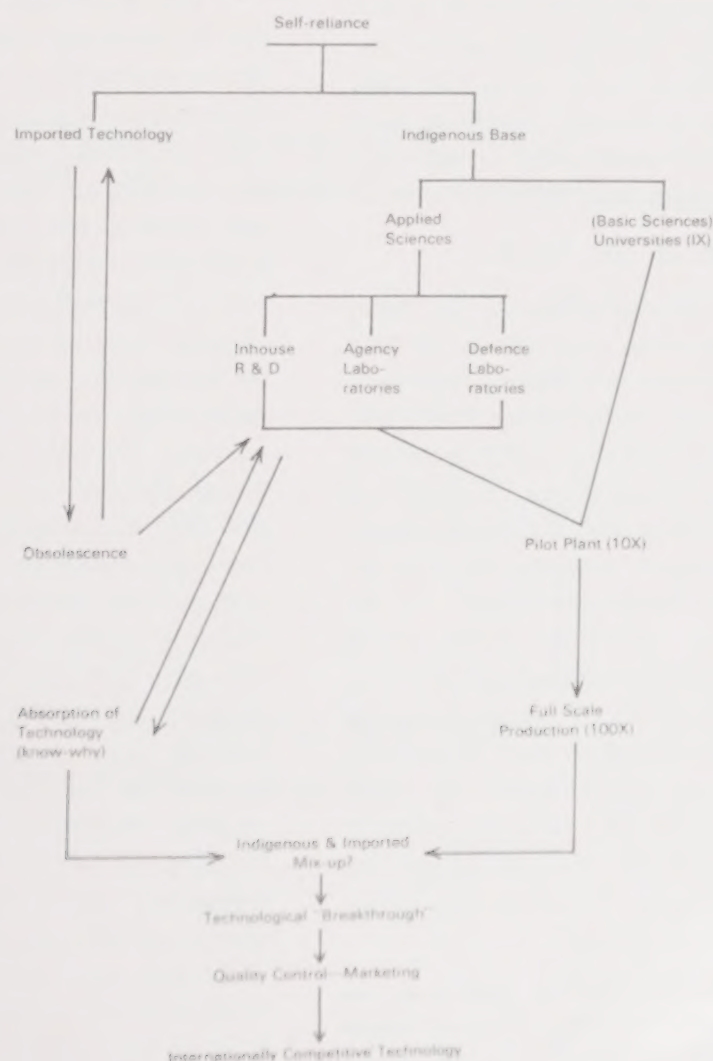
The only way of absorption of imported technology seems to be a certain built-in knowwhy in the agreement with the foreign collaborator and a further development of knowhow in the in-house R&D and agency laboratories by the absorption of technology. This method has already proved to be of advantage in the electronics sector where considerable knowhow in the country is achieved by developmental work and production.

Self-developed knowhow still remains the best way to self-reliance. It may be inferior to an imported technology but definitely better than an incomplete understanding of a "proven" process. The CSIR laboratories had launched a programme of indigenisation of imported technology in 1960 but could not succeed beyond a certain stage due to lack of link with the industry for a full upscaling of their processes. The time has come when we have to bridge the gap between research and final production. The CSIR should move towards

sponsored research by industry and involve industry in the setting up of pilot plants and full scale production. Taking into consideration the incentives given to indigenous knowhow in the TPS, the government should provide risk-funding for proven indigenous technology. NRDC should be further strengthened or a new organization set up to provide a link between CSIR and private industrial sectors. The link between DGTD and CSIR should be further strengthened.

Indian technology suffers from the defect of quality control. The consumer has never been taken into consideration in the development of a consumer product. In this connection, large public sector companies can take up more seriously the aspects of quality control and consumer preferences. A new orientation is needed in our total industrial system to create appropriate linkages and a climate for technological breakthroughs as stipulated in TPS. Only then, we will become internationally competitive.

I conclude by summarising the parameters of self-reliance discussed in this article, through the following chart:



ENVIRONMENTAL CHEMICALS AND HUMAN WELFARE*

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1. Introduction

I am highly honoured to be invited to deliver the first of the series of lectures entitled 'Environment and Man' organized by the Madras Chapter of the Indian National Science Academy in the Golden Jubilee Year of the Academy. Trained as a chemical technologist during my graduate education and subsequently transformed into a biochemist during three decades of post graduate and post doctoral work, chemicals have been very much part of my work on environment. I have chosen the topic 'Environmental Chemicals and Human Welfare' for today's presentation. It shall be my endeavour in this overview to project some of the current thinking on the impact of chemicals, particularly, man made chemicals, on our living environment and through that on our welfare. Perhaps this is one way in which I can pass on conveniently to you at least part of what has become an almost obsession with me. Let me assure you, however, that I shall take care to see that the dose does not reach toxic levels!

2. Man at the Centre of the Earth

In the diagrammatic presentation of the living environment, or the biosphere, you see in Fig 1, I have put man in the centre of the tetrahedron with air, water and land surface constituting the three apices. You will agree with me that among all the living species man has a unique place by virtue of his having evolved into a being with a consciousness which recognizes a past, which is aware of a present and which, also, dares to visualize a future. To the best of our knowledge, although every living organism including the humblest of the humble—the primitive amoeba—responds to environmental stresses, it is given to man alone to feel responsible for his responses and be accountable for their consequences. Water and air are essential for our survival and the land surface sustains the supporting systems such as agriculture, industry and other

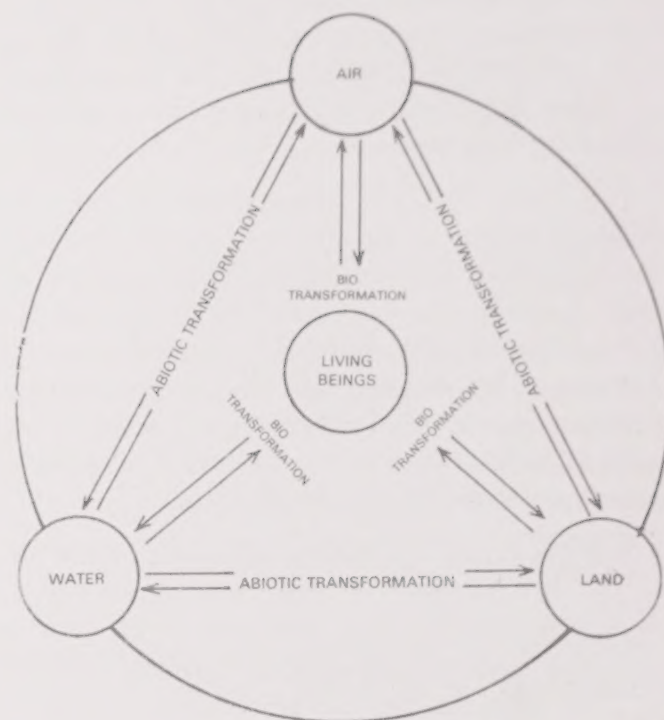


Fig. 1 Ecokinetics Model for Environmental Chemicals

human activities with which our civilization has got itself indispensably interlinked.

The reversible arrows connecting the apices of the tetrahedron represent the dynamic equilibrium of the interactions among the three components of the environment and with man and other species of the microbial, plant and animal kingdom. The interactions are basically physico-chemical in nature and involve the biogeochemical cycles of oxygen, hydrogen, nitrogen, carbon, phosphorous, sulphur and certain metallic elements. Kindly remember that oxygen was the first toxic threat the living cell had to encounter in its aerobic phase of evolution. Adaptation to oxygen by changing it from a toxic element into an essential element was the first 'break-through' in biochemical evolution resulting in not only the establishment of the food chain or the food web centering round photosynthesis by plants and aerobic respiration by higher forms of life and interlinking the biogeochemical cycles of hydrogen, nitrogen and carbon. Adaptation to oxygen also gave rise to the extremely elegant group of enzymes known as mixed-function oxygenases now recognized as the key defence system we have against chemicals foreign to the living systems. Oxygen is also the sink into which all the hydrogen extracted from carbohydrates is discharged as electrons by a series of chain reactions by which the electrons are transported from higher states of reduction to lower states, the carbon is burnt to CO_2 giving rise in the process to the transformation of energy into the chemical bond energy of ATP.

*Based on a lecture delivered on 3 March, 1984 under the auspices of the Madras Chapter of Indian National Science Academy to commemorate the Golden Jubilee Year of the Academy, in the series 'Environment and Human Society.'

The CO_2 is recycled by plants through the process of photosynthesis where it is converted to a highly reduced form by the addition of electrons and the release of molecular oxygen.

3. Human Activity and the Biogeochemical Cycles

The equilibrium maintained by the dynamics of the biogeochemical cycles remained substantially undisturbed till recent times when man in the aftermath of the industrial revolution in the last one hundred and fifty years has been burning fossil fuels and discharging ever increasing volumes of CO_2 into the atmosphere. The cycling of carbon was possible by a natural balance of biomass productivity represented by the forests of the terrestrial regions and the microflora particularly microplankton of the seas. In his upward surge for development man has made habitations all over the globe which has had a serious repercussion in the forest cover of the earth with its own possible impact on climate. The annual increment of CO_2 to the atmosphere in the last fifty years has posed a possible threat of the occurrence of what meteorologists refer to as the 'green house' effect.

Exploitation of earth's resources on an unprecedented scale has created conditions whereby many toxic elements have begun to accumulate as sources of pollution. The use of mercury in the chloralkali and other industries is a standing example of this kind of pollution. The Minamata disease is only too well known to most of you to need any repetition. The property of mercury to be alkylated by aquatic organisms leads to the problem of its bioaccumulation in tissues. The extensive use of zinc and cadmium in many industries has led to the release of cadmium into water bodies and their accumulation by food crops like rice. The Itai-Itai disease which afflicted many in Japan was attributed to the excessive intake of cadmium through water and food.

4. Sources of Chemical Pollutants

There are many sources for the origin of chemicals of concern to the environment. Some of these as major groups is mentioned in Table 1. A

Table 1: Sources of Toxic Chemicals

THERMAL AND NUCLEAR ENERGY
MINING AND MINERAL
PROCESSING CHEMICAL INDUSTRIES
TOXIC PRODUCTS OF MICROBIAL,
PLANT AND ANIMAL KINGDOMS
NATURAL GEOCHEMICAL ACTIVITY

420 MW coal based thermal power plant emits daily 64 million cubic metre of flue gases of which 0.2—0.5% is carbon monoxide, 12.5—15% is CO_2 , 24 tonnes of sulphur combustion products and 70 tonnes of fly ash. Taking only the production of organic chemicals as the index of progress in chemical technology, our production for the period 1972-1982 has been several fold of the production in earlier decades. The expected production of benzene and toluene from coal base in 1984-85 is 45,000 and 6700 metric tonnes respectively. The present levels of air pollutants in major cities like Calcutta, Bombay, Madras, Ahmedabad and Kanpur have been shown by 'a WHO-UNEP sponsored study to be comparable to those which existed in London, Tokyo, or Ann Arbor, Michigan, USA before air pollution control was clamped on those cities. One of the major source of pollutants of concern to us in India is the innumerable small scale or cottage industries engaged in tanning leather, dyeing fabrics, formulating pesticides and pharmaceuticals or dyestuffs. Extensive studies conducted over the last four decades have revealed the contamination of food with mycotoxins, chemicals secreted by fungi when they grow on food grains preserved under indifferent conditions of storage. The plant kingdom is rich in many alkaloidal chemicals known for their varied biological activities including their lethal action on animals and humans. We know of the venoms spat out by the cobra, the wasp, the scorpion and certain marine organisms. Among the geochemically occurring toxic agents are fluoride in the subsoil water of many areas.

The normal cycling of chemical pollutants in the main compartments of the living environment is shown in Fig 2. The problems to be considered in

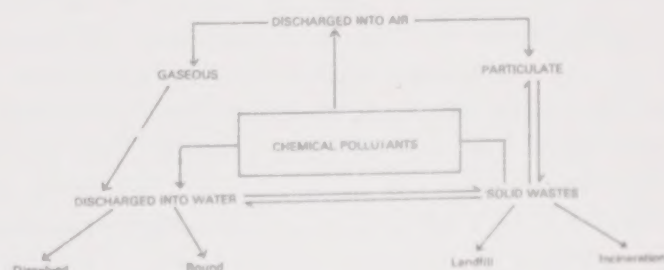


Fig. 2 Cycling of Chemical Pollutants in Environment

dealing with air pollution, water pollution or land pollution are also evident from the figure. The 'acid rain' attributed to dissolved oxides of sulphur can fall on land mass containing buildings, habitations, historic monuments etc or forests sensitive to the action of acid or on water bodies rendering them

In Table 2 are enumerated some of the differences between traditionally known industrial pollutants (40-50 in number) and the innumerable number and vast range of toxic chemicals (about 30,000) produced by the ingenuity of man. The most significant differences are the location of the source of pollutants, their pathways in the environment and the human body and their health effects.

Category	Traditional Pollutants	Toxic chemical
Number	Few (40-50)	Approximately 30,000
Characteristics	Urban and industrial wastes often in gaseous form	Synthetic product. Persistent
Source of emission	Coal—Primary sources	Diffuse—often through product dissipation
Pathways	Usually Direct	Complex
Exposure of concern	Acute effects: Gradients from point of exposure	Variable in time and space and individual
Effect	Visible. Generally reversible Threshold of response generally accepted	Latent; subtle effects Thresholds may not exist

At this stage I wish to introduce the term xenobiotics. In the course of evolution the human body has familiarised itself with many chemicals. It has also learnt ways and means of dealing with them when they turn out to be unfriendly. The means vary from simple acts of disposal such as rendering a lipid soluble chemical to a water soluble chemical or complex immune responses. Chemical substances which the body has not learnt to tolerate are referred to as xenobiotics. Among these are many naturally occurring chemicals of the microbial, plant and animal kingdoms. There are also innumerable chemicals made by man for his industrial and other needs which qualify to be designated as xenobiotics.

Toxicity of a chemical is the sum total of its adverse health effects. As indicated in Fig 3, toxic

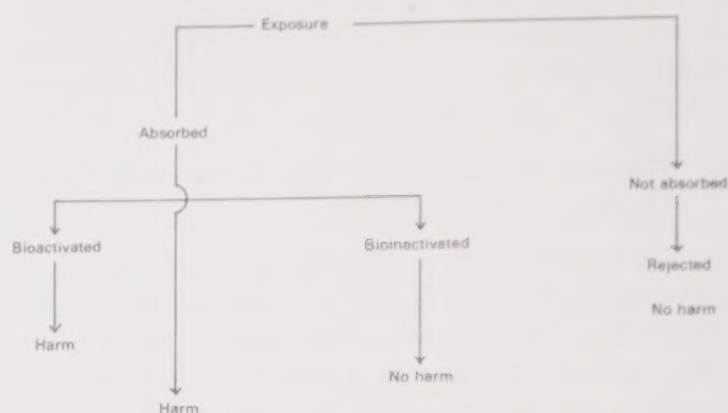


Fig. 3 Exposure, Absorption and Effects of Chemicals

effects manifest themselves only when the toxic chemical is absorbed by the body. After absorption, the chemicals can cause directly harm to the system. They can cause harm upto a point when the defence of the body is stimulated to detoxify or bioinactivate them. In rare instances, the toxicity of a chemical can be magnified several fold by a process of bioactivation. In many examples of cancer inducing chemicals, a process of bioactivation is a must for the expression of toxicity.

The toxic effect of a chemical is often dose dependent which gives us the opportunity to estimate their threshold limits. These are important concepts in determining the 'maximum permissible concentrations' of an otherwise toxic chemical in the work environment or the 'admissible daily intakes' of chemicals such as food additives.

Toxic effects can be either acute or sub-acute and could be either reversible or irreversible. Effects could also appear years after the first exposure has taken place. These delayed effects or chronic effects or cumulative effects are all of concern to us today because of the difficulties encountered in assessing and quantifying them at a stage early enough to permit the institution of preventive measures. Fig 4

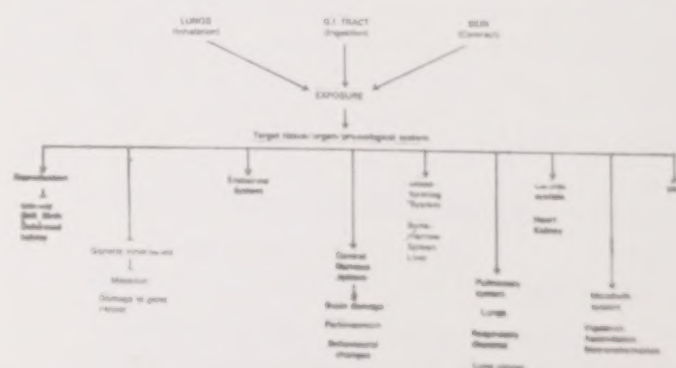


Fig. 4 Profile of health effects of environmental chemicals

gives a profile of the effects of chemicals along with the target organs and the physiological systems affected. The ability of many chemicals in use today to bring about mutational changes or to induce cancer in susceptible human subjects has brought to the fore the urgency to devise test systems for predicting ill effects. It is also mentioned in Fig 4 that the three main ports of entry of chemicals into the body are the lungs by way of inhalation, the gastrointestinal tract by way of ingestion and the skin by way of absorption.

The types of biotransformation reactions to which xenobiotics are subjected are enumerated in Table 3. Most of this activity in the mammals is

Table 3 : Types of Biotransformation Reactions

Reaction	Microsomal	Non-microsomal Intestinal microflora	
Oxidation oxygenation	Aromatic hydroxylation	Alcohol oxidation	
	Acyclic hydroxylation	Aldehyde oxidation	
	Alicyclic hydroxylation	Alicyclic aromatization	
	Epoxidation		
	N-oxidation		
	S-oxidation		
	Desulfuration		
	Dealkylation		
	Deamination	Mitochondria	
		Blood plasma	
Reduction	Nitroreduction	Reduction of sulfoxides and N-oxides	Reduction of N-oxides
	Azoreduction	Reduction of disulfides	Azo reduction
	Dehalogenation		Dehalogenation
Hydrolysis	Ester hydrolysis	Hydrolysis of amides esters	Ester hydrolysis
		Hydrolytic ring scission	Hydrolytic ring scission
		Dehalogenation	

located in the subcellular organelle called microsome of which our liver is one of the main storehouse. Reactions dealing with alcohol or aldehydes do also take place in non-microsomal part of the cell. In the case of mammals, particularly man, the microflora present in the gut also contribute towards

biotransformation reactions. Oxidations and reductions are the key reactions employed by the microsomal defence system. Since molecular oxygen is used in this process the enzymes mediating the reactions are called mixed function oxygenases or MFO. The plots of MFO activity against log of body weight for many mammalian species as given in Fig 5 show a direct relationship of

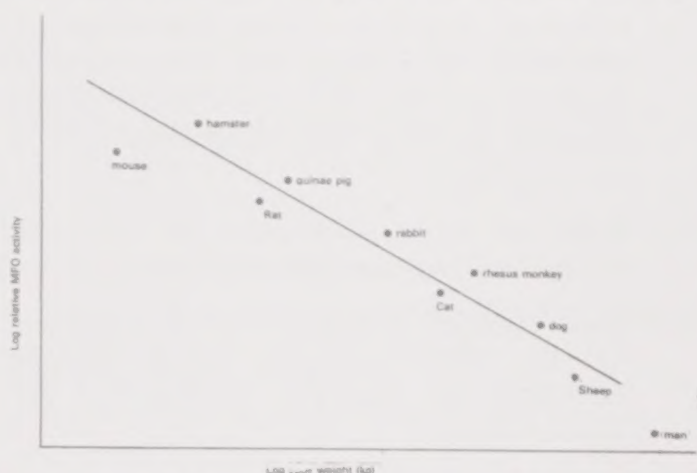


Fig. 5 Plot of MFO Activity of Different Species Against Log PE Body Weight

body size with MFO activity. Please note that, compared to the mouse, man is at a decided disadvantage in this regard and hence our greater sensitivity to many xenobiotics. The MFO activity responds characteristically to environmental stress particularly the stress of some chemicals. The drug barbiturate is known to stimulate the MFO activity. The insecticide DDF also possesses this activity.

6. Safety Evaluation of Chemicals

A large number of synthetic organic chemicals in common use today are potentially toxic to man. Some of these chemicals have become almost indispensable for the life styles prevailing today. The question that arises is: What is the basis on which we accept the risk inherent to the use of chemicals? How do we assess the safety of a given chemical for human use? Currently there is substantial world trade in about 45,000 chemicals. One hundred and fifty chemicals are produced in quantities exceeding 50,000 tonnes annually. About one hundred and fifty million tonnes of synthetic organics are manufactured annually on a global scale. The list of chemicals used for making plastics enumerates about five thousand items of which more than a hundred are recognized as 'highly toxic' (which can kill 50% of a test population of animals in doses less than 1 mg/kg body weight).

Our deep concern today with chemical pollution owes its origin to one or more of the following:

- (i) increasing industrial activity associated with development and dependent on modern chemical technology,
- (ii) growing needs for energy derived in the foreseeable future by burning fossil based fuels,
- (iii) updating of agro-techniques,
- (iv) disturbing revelations by sophisticated analytical techniques (with capabilities of estimating chemicals in the environment in almost traces) that many more chemicals are persistent in nature than we thought to be a few years back.
- (v) ability of some chemicals like DDT or gammexene to accumulate in tissues.
- (vi) newer concepts of hazards to the ecosystem and the classification of cancer causing chemicals as inducers, promoters, co-carcinogens etc.
- (vii) limitations of currently available methods to demonstrate biological effects of chemicals at levels detected by modern analytical techniques; and
- (viii) global spread of chemicals, export of hazardous chemicals and variations in regulatory controls exercised from country to country.

The impact of abiotic transformation and biotransformation of chemicals in the environment is brought out by the model of ecokinetics represented in Fig 1. Based on currently available methods for safety evaluation a model for toxicokinetics of chemicals is proposed in Fig 6 and can be used for deriving threshold limit values (TLV) or maximum permissible concentration (MPC) for chemicals in the work environment and admissible daily intakes (ADI) for chemicals in the living environment (intake through air, water and food).

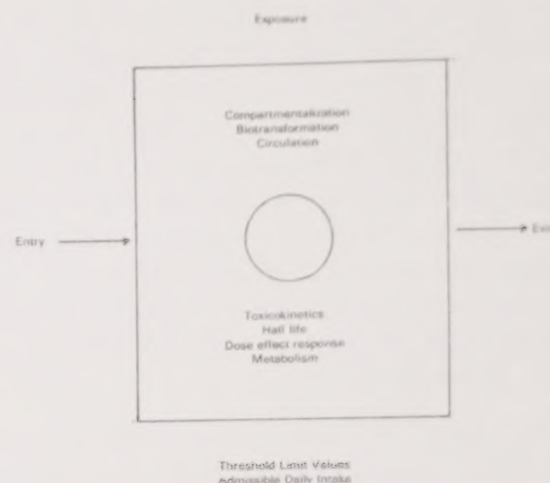


Fig. 6 Toxicokinetic model TLV and ADI for human exposure to chemicals

7. Conclusion

I referred in the beginning to the first breakthrough in adaptation of living systems to a toxic environment—switching over from an anaerobic manner of life to an aerobic one. The dose-response relationship of chemicals, adaptation, tolerance, etc have all brought to light the innumerable ways in which the ingenuity of a living system counters an environmental hazard. We know that many life saving drugs used today are powerful poisons and yet under the supervision of our medical advisers we do take the risk of using these drugs for getting relief from suffering. On an extended scale, in regard to chemicals of common use, there is an urgent need to set up a regulatory and advisory agency to control the use of chemicals after weighing their pros and cons and calculating the minimum acceptable social risk.

Acknowledgement

I am grateful to the Department of Environment, Government of India for financial assistance.

COUNCIL DECISIONS

[Editor's Note:

The present issue consists of the important decisions of the INSA Council in detail from December 1983 to January 1984 preceded by the August and October 1983 decisions as condensed.]

At the August 1983 Council Meeting, the major items discussed were: (1) Ethics in Science; (2) Modifications in Regulation regarding Science Academy Medals for Young Scientists; (3) Young Scientists Awards; (4) Recommendation for Election to Fellowship and Foreign Fellowship 1984; Council 1984; (5) R D Desai Lecture Award; and (6) Foreign Secretary.

The Council felt that it would not be advisable to formulate a comprehensive code of conduct for the scientific community. As the Fellowship has to set standards, the obligation to be sent by the Fellowship after election was modified to read:

"As a Fellow of the Indian National Science Academy, I shall

follow the code of scientific ethics, maintain integrity in research and publications, uphold the cause of science and the dignity of the Academy, endeavour to be objective in my judgment, and strive for the enrichment of human values and thought."

While modifying the regulations regarding Young Scientists' Medals, the Council decided that assistance will be provided by the Sectional Committees in awarding the medals. A Committee was constituted and the nominations were examined and assigned to different Sectional Committees for consideration. The Committee was also authorized to suggest names of Fellows in the area of specialisation of the candidate from whom opinion of a candidate's work may be sought

ACADEMY NEWS

Awards and Honours

Professor C N R Rao, FNA, has been invited by the University of Cambridge (UK) to occupy its first Jawaharal Nehru Visiting Professorship; he has been elected President-elect International Union for Pure and Applied Chemistry. He will be Vice-President till 1985.

Dr Y Nayudamma, FNA, has been chosen for *Sri Raja Lakshmi Foundation Award* for the year 1983.

Dr D V Singh, FNA; has been awarded Railway Boards' First Prize (1981-82) by the Institution of Engineers (India).

Dr B P Pal, FNA, has been presented with the *Daya Vati Vira Medal* for 1983 of the Delhi Agrihorticultural Society for his contributions to Ornamental Horticulture.

Dr Satyaprasad Raychaudhuri, FNA, has been elected Honorary Member of the USSR Society of Soil Scientists.

Emeritus Professor R M Kasliwal, FNA, has been awarded a Silver Plaque and a Citation by AAIMSA International for work in medical and social science field.

Professor D Lal, FNA, has been elected President of the International Union of Geodesy and Geophysics.

Dr M A Salim Ali, FNA, is the recipient of the First National Award for Wild Life Conservation instituted by the Indian Board for Wild Life and Gold Medal of the Asiatic Society of Bangla Desh.

Dr Raja Ramanna, FNA, has been conferred the Honorary Degree of Doctor of Science by the Indian Institute of Technology, Madras and by the University of Madras the DSc (*Honoris Causa*); he has also been awarded the Meghnad Saha Medal-1984 by INSA.

Professor K S Bilgrami has been awarded the *Panchanan Maheshwari Gold Medal* (1983) by the Indian Botanical Society.

Dr K S G Doss, FNA, has been awarded the *Noel Deerr Gold Medal* (1982) by the Sugar Technologists' Association of India.

Dr R K Pal, FNA, has been elected President of the Asiatic Society, Calcutta.

Dr B Ramamurti, FNA, has been selected for the 1983 *Dhanwantri Award* instituted by the Academy.

Dr H K Jain, FNA, has won the *World Food Day's Best Contribution Award* instituted jointly by the Indian Association for the Advancement of Science and the Food and Agriculture Organization of the United Nations.

Professor S Chandrasekhar was awarded the 1983 Nobel Prize for Physics.

Professor P N Tandon, FNA, is the recipient of Jawaharlal Nehru Fellowship, 1983.

Dr N S Subba Rao, FNA, received the *Borlaug Award* for 1982. The *Sanjay Gandhi Award* for 1983 for Science and Technology in the field of environment and ecology has been conferred on Professor Ramdeo Misra, FNA.

Dr S Chandrasekhar, FNA, received the *Desikottama Award* of the Visvabharati University.

The Indian Society of Genetics and Plant Breeding has awarded Plaques of Honour to Dr B P Pal, FNA, Dr V L Chopra, FNA, Dr S Ramanujam, FNA and Dr K Ramiah, FNA

Dr V L Chopra, FNA, has been elected President of the International Genetics Federation for the period 1983-87 and selected for the Professional Excellence Award of NOPEX (the National Organisation of Professional Executives).

Professor M G K Menon, FNA, has been elected honorary member, of the Institute of Electrical and Electronics Engineers.

Professor C L Khetrpal, FNA, is the recipient of the *Shanti Swarup Bhatnagar Award*—Chemical Sciences, Dr R A Mashelkar—Engineering Sciences, Professor B L S Prakash Rao—Mathematical Sciences and T V Ramakrishna—Physical Sciences.

Professor G N Ramachandran, FNA, has been awarded the Albert Einstein Centenary Research Professorship of INSA.

Professor (Mrs) Archana Sharma, FNA, and Professor O. Siddiqi, FNA, have been conferred *Padma Bhushan*.

Professor N B K Nair, FNA, has been conferred *Padma Shri*.

Professor S Dhawan, Dr A S Paintal, Dr Raja Ramanna, Dr H S N Sethna and Dr M S Swaminathan have been conferred the degree of Doctor of Science (*Honoris Causa*) by the University of Delhi.

Dr S Chandrasekhar, Foreign Fellow, has been awarded the first prize for outstanding contributions to gravitation and cosmology by the Dr Tomalla Foundation in Vaduz, Liechtenstein.

Professor S D Chatterjee, FNA, has been elected Fellow of the Institute of Electrical and Electronics Engineers, USA.

The 1983 *Federation of Indian Chambers of Commerce and Industry Awards* have been given to Professor S K Sinha, FNA in the field of Agricultural Sciences; Professor (Mrs) Archana Sharma, FNA, in the field of Life Sciences; and Professor G. Mehta, FNA, in Physical Sciences.

Dr P N Wahi, FNA, is the recipient of *Dr B C Roy National Award* and *Silver Salver* of the Medical Council of India.

Professor A K Saha, FNA, has been elected Corresponding Member of the American Shoulder & Elbow Surgeons (affiliated to the American Academy of Orthopaedic Surgeons).

Professor O Siddiqi, FNA, has been elected Fellow of the Royal Society of London.

Professor S Chandrasekhar, Foreign Fellow, is the recipient of the third *R D Birla Memorial Award* instituted by the Indian Association of Physics.

Dr B Ramamurthi, FNA, has been elected Honorary Fellow of the International College of Surgeons.

Dr L K Doraiswamy, FNA, has been selected for the University of Wisconsin Engineering Citation.

Professor V Ramalingaswami, FNA, has been elected Foreign Member of the USSR Academy of Medical Sciences.

Dr G Venkataraman, FNA, has been awarded the Jawaharlal Nehru Fellowship.

The grading of the candidates would be done as: A—Outstanding; B—Very Good; C—Average; and D—Unsuitable. The Conveners would prepare a list of the grades obtained by the candidates and would recommend them for presentation of their work. In selection, the candidates must have been rated at least 'B' by 50% of the members of the Sectional Committee who have sent in their assessment. Assessment from at least 3 members of Sectional Committees should be received. The work of the candidate under consideration for the award of Science Academy Medals for Young Scientists would be presented in five groups—Sectional Committees I & II; Sectional Committee III; Sectional Committees IV & V; Sectional Committees VI & X; and Sectional Committees VII, VIII & IX.

Considering the recommendations of the Sectional Committees for the award of Science Academy Medals for Young Scientists the Council decided and announced the awards to 17 scientists on August 6, 1983.

The Council appointed a Committee consisting of Professor D S Kothari, Professor V Ramalingaswami and Professor M G K Menon in addition to Professor A K Sharma for awarding the Albert-Einstein Centenary Research Professorship* of INSA.

The Council recommended that Fellows above the age of 60 be exempted from payment of Fellowship dues and approved the payment of Rs. 500/- as honorarium to the authors for

*The announcement of the award was made at the Anniversary General Meeting on January 2 1984 at Ranchi.

preparation of memoirs on deceased Fellows.

Thirty Fellows and 8 Foreign Fellows were selected by ballot for election to Fellowship, and nominate six Fellows for filling up vacancies of the Council in 1984.

The names of the elected Fellows and Foreign Fellows were announced (vide *INSA Year Book* 1984).

The Council deleted the regulation 7(iii) regarding election of Fellows, i.e., copies of all letters from the Members of Sectional Committees containing their original recommendations need not be circulated to the members of the Council but could be placed at the August Council meeting of the Academy. The Council also deleted the regulations regarding R D Desai Lecture Award from the Year Book of the Academy as the offer had been withdrawn.

At the Council Meeting held during September 30—October 1, 1983, it was decided that the information sought in the nomination form for Science Academy Medals for Young Scientists should clearly demarcate work done in India and abroad. The President informed the Council of a letter from the Biren Roy Trust offering an endowment of Rs 2 lakhs for institution of a Fellowship in Physics/Aeronautics. The Trust has asked the State Bank of India, New Delhi to make available to the Academy the annual interest of Rs 24,000/- effective from 1984 from their fixed deposit with the State Bank of India. On maturity, the amount of Rs 2 lakhs will be handed over to the Academy for investment, the return to be used for the purpose of the Fellowship. The Council decided that the Fellowship should preferably be to a scientist of reputation for a period of 2 years at the first instance extendible if necessary

In the two months of December 1983 and January 1984, the INSA Council had met thrice, i.e., on 4 December 1983 and on 1-2 and 15 January 1984. Some important decisions at these meetings are reported here.

Council Meeting, New Delhi—4 December 1983

Professor R K Asundi Memorial Lectureship

The Council approved Regulations as given at Appendix—I regarding *Professor R K Asundi Memorial Lectureship*.

Workshop on Role of Scientific Societies and Academies in National Development

The President informed the Council about the workshop on the 'Role of Scientific Societies and Academies in National Development' which was held during November 15-16, 1983 at the Academy. This was attended by the representatives of the Academies of Afghanistan, Bangladesh, China, Malaysia, Nepal, Sri Lanka, Singapore and Thailand. During the workshop, the idea of a *Federation of Regional Academies* emerged and a Consultative Committee under the Chairmanship of Professor A K Sharma, President, was constituted.*

List of Nominations for Election to Fellowship during 1984

The Council examined the list of nominations valid for consideration during 1984 and approved the list.

The Council recommended that the nomination of P D Dogra be considered by Sectional Committee-X instead of Sectional Committee-VI.

It was brought to the notice of the Council that in respect of mathematical sciences very few nominations were received and the number of nominations for consideration for the award of Science Academy Medals for Young Scientists 1984 was not large. It was considered necessary to analyse this issue affecting this country in respect of training and high calibre manpower in mathematical sciences. President, INSA was authorized to take appropriate action which he deems proper in consultation with other concerned agencies.

Dr S Varadarajan's Letter to Professor M G K Menon

A letter dated September 25, 1983 written by Dr S Varadarajan, Secretary, DST to Professor M G K Menon, Member, Planning Commission was considered.

In respect of the 60th Anniversary of Bose Statistics, it was suggested that an Essay competition for Ph D level students be held and the winner be awarded a one time Professor S N Bose Young Scientist Medal of INSA at the time of the inauguration of the Science Congress Session.

One of the suggestions was a publication on S N Bose's life, works and contributions to Physics. The editorial work of this publication could be undertaken by Professor Virendra Singh of TIFR who may seek cooperation from Professor S D Chatterjee and others may be coopted.

*An outcome of the Consultative Committee Meeting that met on January 15, 1984 was the creation of the Federation of Asian Academies and Societies (FASAS) which has already been reported in *INSA News*, No. 69 of April 1984.

The Council approved the nomination of Professor S D Chatterjee, FNA on the Advisory Board of the Rabindra Nath Tagore Birth Centenary Plaque for 1983 of the Asiatic Society, Calcutta.

In addition to the above, the Council considered a letter dated 25 October 1983 from Professor S Raghavan, FNA and authorized the President to examine appropriate steps to perpetuate the memory of the late Professor Harish Chandra, FNA.

Council Meeting, Ranchi—1-2 January 1984

Fall in Standards in Mathematical Sciences

The Council was informed that the President had appointed a Committee to look into the matters concerned with the fall in standards in mathematical sciences in the country. This Committee would also consider the method of perpetuating the memory of late Professor Harish Chandra, FNA.

The Committee consists of

Professor R P Bambah

Professor R S Mishra

Professor K R Parthasarathy

Professor S K Trehan

One representative of the School of Mathematics, TIFR, Bombay

One representative (Concerned with mathematical training) at NCERT, New Delhi

Government of India Technology Policy Statement

The Council was of the view that an in depth analysis of the Technology Policy Statement was to be made by a small group of experts and later the Council could consider the report from this Committee.

The Council authorized President, INSA to constitute this Committee.

Resolution of the INSA Local Chapter, Lucknow

Considering the resolution adopted by the INSA Local Chapter, Lucknow, at its meeting held on 19 November 1983 regarding the role INSA Fellows can play in the national development after their retirement from active service, the Council agreed in principle to the suggestion that financial support provided to those Fellows who are in the age group 60-70 and are still active in research for the pursuit of their scientific work.

The Council appointed a Committee consisting of Professor B R Rao as Chairman and Professors S K Joshi, P N Tandon, and Dr D S Bhakuni as members to prepare a document for consideration.

The Meghnad Saha Medal 1984

The President submitted for consideration of the Council the name of Dr R Ramanna, FNA, for the award of the General Medal—*The Meghnad Saha Medal* due for the year 1984, and the Council decided on the award of the medal to Dr R Ramanna.

Editor's note contd . .

or for a period as the Council may think fit.

The Biren Roy Trust also indicated that of the amount of Rs 10 lakhs to be donated by them to the Academy's building fund, Rs 1 lakh will be paid as soon as they receive intimation of the laying of the foundation stone. The State Bank of India, New Delhi, has been requested to make available the balance of Rs 9 lakhs within a year on being informed of the progress of the construction of the new building by Professors AK Sharma and SD Chatterjee. This amount is to be used for the construction of the ground floor of the building.

The Council agreed to the proposal of Shri Biren Roy, appreciated the gesture and resolved that "the ground floor of the building be named after 'Biren Roy Trust—Behala'" and a suitable plaque be so inscribed and fixed.

The Council decided to accept the endowment of Rs 25,000/- for the institution of *Professor R K Asundi Memorial Lectureship*. This will be delivered under the auspices of one of the Local Chapters of the Academy.

It was decided to contact Professor N A Narasimham to find whether he will be making available an amount of Rs 5,000/- for the lecture to be delivered in 1984. In case an additional amount of Rs 5,000/- is not made available Rs 5,000/- out of the Rs 25,000/- to be made available will be used for the 1984 lecture and Rs 20,000/- invested from the returns of which the R K Asundi Memorial Lectureship will be arranged every alternate year. This lecture will alternate with the Professor K Rangadhama Rao Memorial Lectureship.

Professor N A Narasimham was also requested to keep the

Academy informed of the visit of Dr G Herzberg who may deliver the lecture in 1984 in India. The Academy will only be paying internal travel to Dr Herzberg.

The Council decided to wind up the National Committee for the International Union of Physiological Sciences, as the Association of Physiologists and Pharmacologists of India (APPI) that adheres to the IUPS regretted its inability to adhere to INSA and as Dr B K Anand, Chairman, IUPS requested the Academy to relieve him of the Chairmanship.

Based on a suggestion that the Academy should examine the possibility of bringing to the notice of the scientific community of the country the outstanding contributions of Indian scientists and positive aspects to Indian science, the Council constituted a Committee consisting of Professors T N Ananthakrishnan, S K Joshi, M G K Menon, C N R Rao, E C Subba Rao, P N Tandon and Dr S Sriramachari to examine of how to reflect the positive aspects of Indian science.

MISCELLANEOUS NEWS

Electron microscope Facility at AIIMS

Scientific research requires highly sophisticated and expensive major equipment. Such equipment, when acquired, very often are not put to maximum utilization due to various constraints. In order to utilize the resources and equipments maximally, the Department of Science and Technology has initiated a programme by setting up "Regional Sophisticated Instrumentation Centres (RSIC)" in the Country.

The established RSIC facilities that are operational are located at Bombay, Calcutta,

Council Meeting contd

Appointment of Architects for New Building

The Council was informed of the terms and conditions of appointment of architects for the construction of an additional building in the premises of the Academy (Appendix-II).

The President thanked the outgoing members of the Council—Dr Brahm Prakash,* Professor J S Datta Munshi, Professor Ramdeo Misra, Professor H L Nigam, Professor S Raghavan and Professor O Siddiqi for their advice and cooperation during their term of office.

Council Meeting—January 15, 1984, New Delhi

The President welcomed Professors U C Agarwala, J Barnabas, A Ghosh, R Narasimha, K S Valdiya and M S Raghunathan, incoming members of the Council.

Uninformed Criticism of Indian Science

The matter was discussed by the members of the Council. It was generally agreed that the best way to consider such criticism is to project the positive contributions of Indian Science; no purpose would be served by rebutting such statements individually. The members expressed their concern regarding the much advertised creation of 'Science City' to attract Indian scientists settled abroad. While their return to the home country should be welcome, to enhance our scientific resources, it was generally agreed that it should not be at the cost of downgrading the status of those who cast their lot to work in the country. Dr Varadarajan explained the factual position, which appears to be quite different from the press statements.

Modifications in Regulations 5 regarding Science Academy Medals for Young Scientists

"Nominations for the award": Name of the candidate may be proposed by the Fellows of the Academy/any scientific society of all India Character/university faculties/post-graduate departments or research institutions. Each nomination shall be accompanied by detailed statements of the nominee. The statement should demarcate clearly the work done in India and abroad. The proposer should indicate two referees with their present contact address who are authorities in the field of research of the nominee proposed for consideration for the award and are not associated with the conduct of the research work concerned.

Notification inviting nominations for the award shall be issued each year after the Ordinary General Meeting of the Academy to be held in August.

The nominations with all relevant information must reach the Academy latest by 15 November.

Council Meeting 4-5 May 1984

Vacancies occurring in the Council for 1985

The Council determined that vacancies in respect of President, Vice Presidents, Treasurer, Foreign Secretary, Secretary (Biological

*Since deceased

Council Meeting contd. . .

Sciences) and six members of the Council against the following retiring members :

Professor Sadan Basu
Dr D S Bhakuni
Professor G B Deodikar
Dr P K Iyengar
Professor (Miss) Anna Mani
Professor E C Subba Rao

after the Anniversary General Meeting of the Academy in January 1985.

Proposal for Modification of regulation 5 regarding Election of Fellows

The Council decided to modify regulation 5 regarding election of Fellows as follows :

"The Council decided that Regulation 5 be modified to read: *List of nominations to be printed*: Not later than 1 March a list arranged in alphabetical order, of the nominations to be considered by each Sectional Committee, together with brief statement regarding the most significant research achievements, names of Fellows by whom each person is proposed, seconded and supported, the year in which the nomination was considered for the first time and the year of the birth of the nominees shall be printed and a copy shall immediately thereafter be sent to every Fellow. This book shall contain the superscription 'Confidential for use of Fellows of the Academy only. The book is to be destroyed or returned to the Academy by 30th September of the year.' The envelopes in which this book of nominations is posted to the Fellow should be marked 'Confidential.'

Modifications in Regulations Regarding Science Academy Medals for Young Scientists

The Council decided that the following may be added in the Nomination Form :

Whether the nominee has been proposed for consideration in any earlier year(s). If so, indicate the Sectional Committee to which the nomination was referred to. If a change in the Sectional Committee from that of the previous year(s) is now proposed, please state the reason for the same.

The Council also decided that the awardee will in addition to first class rail fare and daily allowance be paid conveyance charges for journeys from residence to railhead and railhead to venue of the session and back.

Institution of Dr Vainu Bappu Memorial Award

The Council decided to accept the endowment of Rs 3 lakhs from Mrs Sunana Bappu for the institution of the *Dr Vainu Bappu Memorial Award*. The award shall be in the field of Astronomy and Astrophysics. Besides Indian Scientists, the scientists from other countries will also be eligible for nomination for this award.

Promotion of Interest in Mathematics

The recommendations of the committee constituted to suggest measures to encourage and promote interest in Mathematics were considered by the Council. The Council authorised the President to

News contd. . .

Madras, Lucknow, Bangalore, New Delhi, Nagpur, Chandigarh and Shillong. A wide range of sophisticated instruments are now available for use at the various RSICs.

This announcement pertains to the *Electron microscope Facility* that is operational at the *All India Institute of Medical Sciences (AIIMS), New Delhi* under the *RSIC Programme of Department of Science and Technology*. The EM Facility at AIIMS caters for scientists and investigators of all disciplines from educational and research institutions, R & D laboratories and industries on nominal charges. The facilities include a Scanning Electron microscope (Philips EM 501), Specimen Coating Unit and a Transmission Electron Microscope (Philips EM 300). The scientists are requested to make full use of the opportunities now available at AIIMS for ultrastructural studies. Besides offering research facilities, a training programme in the use and application of electron microscopy is being organized bi-annually. For further details, write to:

Dr G F X David, Regional Electron Microscope Facility, Room No. 1012, Department of Anatomy, All India Institute of Medical Sciences, New Delhi 110029, India. Tel: 665995, 661831.

The Corday-Morgan Memorial Fund

The Royal Society of Chemistry (RSC) Corday-Morgan Memorial Fund exists to assist members of any established Chemical Society/Institute in the Commonwealth to visit chemical establishments in another Commonwealth country. There is no restriction on age but the visits must be clearly of benefit to the country concerned. It is hoped

News contd.

that lectures will be given during a

The maximum award to any individual is normally £500 and persons eligible must be citizens of, and domiciled in, any Commonwealth country. Applicants must be travelling to another country (not necessarily in the Commonwealth) and would stop en route to visit a third country which must be in the Commonwealth. Funding would cover the additional costs of the stopover, together with appropriate subsistence.

The closing dates for receipt of applications are normally 1 April and 1 October, and these are strictly observed. Applications should be submitted on the official form before the last appropriate closing date, even if information concerning other aspects of the visit is still awaited.

An application form for support from the fund is available on request from The Corday-Morgan Memorial Fund, C/o The Secretary General, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN.

INSA Local Chapters

INSA has its local chapters in different Indian cities for the purpose of conducting or organising different scientific activities. The activities of some of the local chapters during 1983-84 are briefly condensed and reported below :

Gujarat

The Physical Research Laboratory was the venue of the meeting of the Chapter on April 11, 1983 wherein it was decided to hold the following workshops of the seminars during the year 1984 on : (i) INSA University Interaction; (ii) INSA Industry

Council Meeting contd.

arrange a group discussion for the identification and nurturing of young mathematicians. There was a detailed discussion on the identification, and recognition of gifted students at the school level in which all members participated. It was decided that the Academy should also examine the method of recognising talented students at that level.

The Local Chapters of the Academy also examine the possibility of conducting summer schools for national talent scholars.

The Council authorised the President to examine the possibility of instituting a *Harish Chandra Memorial Lectureship* in Mathematics.

It was decided that the Academy should look into the question of celebrating the Srinivasa Ramanujan Centenary in 1987 in an appropriate manner.

INSA Golden Jubilee Biren Roy Trust Research Fellowship

The Council approved regulations regarding the INSA Golden Jubilee Research Fellowship as given at Annexure-III.

Federation of Asian Scientific Academies and Societies (FASAS)

The Council approved formation of a cell, and Secretarial Assistance to the Federation of Asian Scientific Academies and Societies (FASAS) by INSA as well as inclusion in the Year Book.

Extension of Service of the Executive Secretary

The President informed the members that the contract period of service of Mr A K Bose as Executive Secretary is due to expire. The Council unanimously resolved that in view of the outstanding service rendered by him to the Academy in furthering its objectives and his indispensability in executing the numerous programmes initiated during the Golden Jubilee year, his contract be extended for another two years.

Representation of INSA on other Organisations

Professor (Mrs) Asima Chatterjee, FNA has been nominated to the Committee to decide the *Professor T R Govindachari 60th Birthday Commemoration Award* in Organic Chemistry (1983-84) Madras University, Madras.

Professor V G Bhide, FNA has been nominated to the Council of the Indian Cryogenics Council, Calcutta.

Professor R C Misra, FNA has been nominated to represent INSA on the Governing Body of the Birbal Sahni Institute of Palaeobotany.

Professor P N Tandon, FNA has been nominated to represent INSA at the 40th Annual Session of the Sri Lanka Association for the Advancement of Science to be held in Colombo during 10-16 December, 1984.

Dr P Koteswaram, FNA has been nominated on the Committee on Weather Modification Experiments for the term of two years from August 1983.

Obituary

Professor B I Sundararaj

Professor B I Sundararaj born on 29 January 1932 died in Delhi on 7 October 1983 at the age of 51. A specialist in Fish Endocrinology and Chronobiology, he was elected to Fellowship of the Academy in 1974. He was Professor of Zoology, University of Delhi.

Dr D R Malhotra

Dr D R Malhotra born on 4 October 1899 died at Ajmer on 3 November 1983 at the age of 84. A specialist in Metallurgical Engineering, he was elected to Fellowship of the Academy in 1946. He was Industrial Adviser to the Government of India and Technical Manager and Chief Engineer, Sepulchre Bros. (India) Pvt. Ltd. He was member, INSA Council during 1954-55

Dr P K Bose

Dr P K Bose born on 5 September 1898 died on 1 November 1983 at the age of 85. A specialist in Photochemistry & Synthetic Organic Chemistry, he was elected to Fellowship of the Academy in 1944. He was formerly Director, Indian Lac Research Institute and later Emeritus Scientist.

Professor Harish Chandra

Professor Harish Chandra born on 11 October 1923 died in November 1983 at Princeton, New Jersey, USA. A specialist in Harmonic Analysis, he was elected to Fellowship of the Academy in 1975. He was Professor of Mathematics, The Institute for Advanced Study, Princeton. He was the recipient of Srinivasa Ramanujan Medal 1974 of the Indian National Science Academy.

Professor B R Puri

Professor B R Puri, Research Director, India Carbon Ltd., born on 6 February 1909 died in New Delhi on 12 December 1983 at the age of 74. A specialist in Physical & Surface Chemistry, he was elected to Fellowship of the Academy in 1977. He was formerly Professor of Physical Chemistry, Panjab University, Chandigarh.

Professor K K Nanda

Professor Emeritus K K Nanda, Department of Botany, Panjab University, Chandigarh, who was born on 1 January 1918 died on 13 December 1983 at the age of 65. A specialist in Plant Physiology, he was elected to Fellowship of the Academy in 1973. He was Professor of Plant Physiology, Department of Botany, Panjab University, Chandigarh.

Dr Brahm Prakash

Dr Brahm Prakash, born on 21 August 1912 died in Bombay on 3 January 1984 at the age of 72. A specialist in Metallurgical Engineering, he was elected to Fellowship of the Academy in 1969. He was formerly Director, Vikram Sarabhai Space Centre, Trivandrum. He was awarded the Shanti Swarup Bhatnagar Medal 1979 of the Academy. He was member, INSA Council during 1970-72 and during October 1981-83

Local chapters...

Interaction; and (iii) Science Society.

The INSA-University Interaction Workshop was held at MS University, Baroda under the Convenership of Professor S S Merh, FNA on October 8, 1983. The recommendations of the Workshop are awaited from Professor Merh.

The second meeting of the chapter was held on October 8, 1983 at the Gujarat Engineering Research Institute, Baroda. Dr M M Taqui Khan, FNA, Director, Central Salt and Marine Research Institute was the Convener of the Seminar on INSA-Industry Interaction which was held in January 1984 (see p. 1.).

Bombay

A meeting of the Bombay chapter was held at the Tata Institute of Fundamental Research on May 21, 1983 wherein it was decided to prepare biographical notes on three deceased fellows of the Academy in addition to the seven from the Bombay Region for which INSA had already written to the concerned scientists. The cooperation of the Maharashtra Association for the Cultivation of Science was an important subject of discussion at the meeting with Professor B V Thosar, FNA. This committee under the Convenership of Professor Thosar met on September 22 but could not formulate any decision or conclusion which only leads us to the general observation that fellows are not able to find time to initiate any programme of activity in the local chapters.

Hyderabad

A Seminar on the Application of Basic Techniques in Plant Improvement was held under the auspices of the INSA-Hyderabad Local Chapter at the International Crop Research Institute for the

Local chapters

Semi Arid Tropics, Pattanbhere on September 10, 1984 organized by Dr J S Kanwar and chaired by Dr L K Ramachandran which covered Genetic Resources and Germ Plasm Banks (J P Moss and V R Rao), Chromosome Studies (A K Singh), Haploidy (N L Subrahmanyam), Mutation Breeding (G M Reddy) and Alternative Techniques (D C Shastri). The seminar was well attended and was followed by discussions and a field trip.

Delhi

The chapter organised two lectures (1) "C V Raman" by Professor S Ramaseshan, Director, Indian Institute of Science, Bangalore on September 27, 1983 in the Physics Lecture Theatre, University of Delhi jointly with Indian Association of College Going Scientists and (2) "The B D Tilak Lecture on Rural Development-1983" by Professor P V Sukhatme, FNA, Emeritus Professor, Maharashtra Association for Cultivation of Science and Technology, Pune on October 5, 1983 at the Lady Irwin College, New Delhi during the Silver Jubilee of the Department of Foods & Nutrition of the College.

Kharagpur

The chapter aims at the dissemination of scientific knowledge and creation of scientific interest among the local population. As a part of this programme of activity, distinguished scientists are being invited to deliver lectures on topics of popular interest at IIT. The members of this Chapter have also resolved to deliver popular science lectures in the local teaching institutions and provide encouragement and assistance to the deserving young scientists. Status reports highlighting current activities in different branches of science and technology are being prepared.

Obituary contd . .

Professor P N Ganapati

Professor P N Ganapati, born on 15 July 1910 died in Bombay on 5 January 1984 at the age of 73. A specialist in Protozoology and Marine Zoology, he was elected to Fellowship of the Academy in 1961. He was Honorary Professor in Zoology, Andhra University.

Professor E K Janakiammal

Emeritus Professor E K Janakiammal, Centre of Advanced Studies in Botany, University Botanical Laboratory, University of Madras, born on 4 November 1897 died on 1 February 1984 at the age of 87. A specialist in Cytogenetics & Plant Geography, she was elected to Fellowship of the Academy in 1957. She was Director, Central Botanical Laboratory, Botanical Survey of India, Allahabad.

Dr M R Sahni

Dr M R Sahni born on 1 March 1899 died on 13 January, 1983. A specialist in Indian Geology, he was elected to Fellowship of the Academy in 1950. He was member, INSA Council (1963-65).

Academician P Kapitza

Academician P kapitza, born on July 1894 died on 8 April 1984 at the age of 89. A specialist in Nuclear Physics, he was elected to Foreign Fellowship of the Academy in 1956. He made outstanding contributions to the development of magnetic physics, low temperature physics, electronics and plasma physics. He shared the 1978 Nobel Prize in Physics with two American radio-astronomers, getting the award for pioneering research on low temperature physics. He was Director, Institute of Physical Problems, Academy of Sciences, Moscow.

Shri S L Malurkar

Shri S L Malurkar, born on 15 August 1903 died on 26 April 1984 at Bangalore. A specialist in Mathematical Physics, Meteorology and Geophysics, he was elected to Fellowship of the Academy in 1956. He retired as Director, Colaba and Alibag Observatories, Bombay.

Professor K B Madhava

Professor K B Madhava, born on 13 May 1895 died on 26 April 1984 at Madras. A specialist in Mathematics and Statistics, he was elected to Fellowship of the Academy in 1940. He was formerly Professor of Statistics and Mathematical Economics, Mysore University. He was Additional Member, INSA Council 1944-46.

Forthcoming Symposia/Seminars/Conferences/Workshops

January 24-26, 1985

First National Symposium on Comparative Endocrinology of Invertebrates

Goals	To evaluate the existing scientific knowledge in the field of comparative endocrinology of invertebrates and to identify the needs of research and development in this field
Topics	(1) Histology and histochemistry of neurosecretory system. (2) Hormonal control of Reproduction - comparative approach (3) Moults, growth and metamorphosis (4) Endocrine control of respiration, osmoregulation and metabolism and

- (5) Physiology of neurosecretory cells and chemistry of invertebrate hormones

Abstracts	: Those who intend to participate must submit an abstract not exceeding 250 words; it should be typewritten and double spaced. The deadline for submitting abstracts is October 31, 1984
Registration	: A registration fee of Rs 75/- will be charged from each participant to cover conference materials, lunch and refreshments.
Sponsors	: University Grants Commission, New Delhi, Comparative Endocrine Society of India, Marathwada University, Aurangabad.
Correspondence	: Those interested in participation at this symposium should contact the <i>Convener</i> : Professor R Nagabhushanam at the address of the Secretariat.
Venue and Secretariat	: Zoology Department, Marathwada University, Aurangabad 431004.

September 3-7, 1984

Fifth International Conference on Rapidly Quenched Metals, RQ 5, General Features

- General Features of Rapid Solidification Technology
- Solidification at Large Undercooling
- Rapid Solidification Processes
- Phases and Microstructures Formed by Rapid Solidification and by Subsequent Treatments
- Glass-Forming Ability and Crystallization of Amorphous Alloys
- Amorphous Structures
- Atomic Motion and Structural Changes in Amorphous Alloys
- Electronic Properties and Low Temperature Effects in Amorphous Solids
- Electrical Properties and Applications
- Magnetic Properties and Applications
- Mechanical Properties and Applications
- Chemical Properties and Applications
- Hydrogen in Rapidly Solidified Alloys
- Relationships between Metallic and Non Metallic Amorphous Materials

Correspondence:

Professor H Warlimont
Conference Chairman, RQ 5
Postfach 2253
D 6450 HANAU
Federal Republic of Germany

November 1-30, 1984

Workshop in Neurosciences

The above one month workshop will be conducted by Dr S D Telang of the Biochemistry Department, Baroda University, Baroda for scientists from India and Southeast Asia working in university departments and medical institutions wanting to initiate teaching and research in neurobiology.

COSTED will provide support for travel of 5 participants from Southeast Asia. Curriculum vitae to be sent to Dr Telang.

January 15 19, 1985

Asian Congress of Pharmacology

Sponsors : International Union of Pharmacology, Indian Pharmacological Society, Indian National Science Academy

Co sponsor : COSTED

The deadline for advance registration and receipt of abstracts is September 30, 1984. For details write to:

Professor B N Dhawan, FNA, FAMS
Pharmacology Division
Central Drug Research Institute
Lucknow 226001 India

Local chapters

Madras

Besides organising two meetings of the Fellows of Madras chapter to plant a programme of the chapter during 1984 for example the Golden Jubilee activities of INSA, Environment week, Monthly disciplinewise lectures, Science exhibition, and Lecture presentation at interschool and intercollegiate levels are being contemplated. The Chapter sponsored the symposium 'Modern Advancements in Medicinal Chemistry' arranged at Loyola College, Madras (January 26, 1983), convened a lecture 'Biochemistry of ageing,' by Professor M S Kanungo, FNA (Department of Zoology, Banaras Hindu University, Varanasi) on March 13 1983, and sponsored the Symposium 'Progress in Polymet Science and Technology' arranged at Loyola College, Madras (August 15, 1983).

Roorkee

Two science scientific film shows were arranged for staff and students of the local institutes, schools and colleges. The first concerned water and the films shown were:

1. Most vital Resource—Water
2. Waste Not
3. Water (R)
4. Nor any drop to drink

These were views by about 530 teachers and students. The second concerned ATOM and the films were:

1. International Atom and Nuclear Countdown
2. Power to the People
3. BOO-OM

Indian National Science Academy

Minutes of the 17th Annual General Meeting of the Indian National Science Academy held at 1, 1/2, Mani and 1, October 1983 at INSA, New Delhi.

Fellows present

A K Sharma, President	P K Iyengar	N S Randhawa
C N R Rao, Vice-President	A C Jain	P K Sen
S Sriramachari, Vice-President	Anna Mani (Miss)	Archana Sharma (Mrs.)
D S Bhakuni	K N Mehrotra	S K Sinha
P Bhattacharya	S K Mukherjee	P N Srivastava
D P Burma	R Misra	N S Subbarao
K L Chopra	A S Paintal	S K Joshi, Secretary
V L Chopra	B P Pal	P N Tandon, Secretary
K S Gill	C C Patel	

Condolence

The death of Dr B B Sen, member of the Academy was recorded and a printed scroll of condolence was presented to his family on his behalf.

Confirmation of the Minutes of the Ordinary General Meeting held on 6 August 1983

The minutes of the Ordinary General Meeting of the Indian National Science Academy held on 6 August 1983 at INSA, New Delhi read by Professor P N Tandon, Secretary, INSA, were confirmed.

Admission of Fellows under Rule 13

Professor S R Sridhar introduced by Professor R Mehta, Professor K L Choudhury introduced by Professor S K Jain and Dr K R Randhawa introduced by Professor K S Gill were admitted to Fellowship of the Academy. They signed the register and received their scrolls.

Scrutiny of Voting Papers for the Election of Officers and Members of the Council for 1984

Dr D S Bhakuni, Professor D P Burma, Professor B Chowdhury, and Professor K N Mehrotra were appointed scrutineers.

The Secretary (Professor P N Tandon) announced the names of those elected as members of the Council and Officers for the year 1984.

Award of the Homi J Bhabha Medal—1984

The award of the Homi J Bhabha Medal 1984 to Professor K G Ramanathan, FNA, for his outstanding contributions in the field of number theory in particular to the analytic and arithmetic theory of quadratic forms and associated zeta functions was announced.

Award of the Sunder Lal Hora Medal - 1984

The award of the Sunder Lal Hora Medal 1984 to Professor P N Mehra, FNA, for his outstanding contributions in the field of cytology, anatomy and life histories of the liverworts, ferns, conifers and flowering plants of the Himalayas and several original postulates in regard to the phylogeny of these plants was announced.

P C Mahalanobis Medal - 1984

The award of the P C Mahalanobis Medal 1984 to Professor Gopal Swamy, FNA, for his outstanding contributions in the field of radioastronomy and associated technologies in large antenna systems was announced.

Sisir Kumar Mitra Lectureship—1984

The award of the Sisir Kumar Mitra Lectureship 1984 to Professor (Mrs) A Arora Chatterjee, FNA, for her outstanding contributions in the field of Chemistry of plant products was announced.

Bires Chandra Guha Lectureship—1984

The award of the Bires Chandra Guha Lectureship 1984 to Professor B K Bhatnagar, FNA, for his pioneering contributions in immunohistochemistry, system enzyme, malnutrition, on liposomes as specific target oriented delivery systems, Acetophenone, benzamide and lectin in enzyme immune assays was announced.

Professor K Rangadhama Rao Memorial Lecture—1983

The award of the Professor K Rangadhama Rao Memorial Lectureship 1983 to Dr N A Narasimham, FNA, for his valuable contributions in the field of Spectroscopy was announced.

Dr G P Chatterjee Memorial Lecture—1983

The award of the Professor G P Chatterjee Memorial Lectureship 1983 to Dr B N Sengupta, FNA, for his significant contributions in the studies of pathogenic and non pathogenic amoebae was announced.

Professor B D Tilak Lecture Award - 1983

The award of the Professor B D Tilak Lectureship 1983 to Professor P V Subbarao, FNA, for his outstanding contributions in the field of science and life through innovative and effective application of science and technology was announced.

Memorandum of the Bashambar Nath Chopra Lecture - 1983

The memorandum of Rs 1,500/- attached to the Bashambar Nath Chopra Lectureship 1983 was presented to Dr S Sriramachari, FNA.

Dr Sriramachari delivered a lecture on 'Pathogenesis of Cerebral Oedema' at 4.00 p.m. on 1 October 1983.

Nomination of the Representatives of Cooperating Academies on the Council for 1984

The nomination of the following as representatives of Cooperating Academies on the Council of the Indian National Science Academy for 1984 was announced.

The Asiatic Society, Calcutta: Dr R K Pal, FNA, 5/4 Ballygunge Place, Calcutta.

Indian Science Congress Association: Professor A S Pant, FNA, Director, V P Chest Institute, University of Delhi, Delhi

Report of the Council for the year 1982-83

The report of the Council for the year 1982-83 was presented by Professor P N Tandon, Secretary, INSA.

Submission of the List of Fellows

List of Fellows corrected up to date was presented by the Secretary.

Proposal for Amendment of Rule 14 regarding Modification in the Obligation to be Subscribed by Fellows

The General Body approved the proposal for amendment of Rule 14.

Proposal for amendment of Rule 19 regarding the reduction of age limit from 65 to 60 for exemption from the payment of Annual INSA subscription.

The General Body approved the proposal for amendment of Rule 19.

The meeting ended with a vote of thanks to the Chair.

Sd/-

(P N TANDON)

Secretary

Sd/-

(A K SHARMA)

President

Indian National Science Academy

Minutes at the 10th Anniversary General Meeting of the Indian National Science Academy held at 4.00 p.m. on Monday 2 January 1984 at the Auditorium on Ranchi College, Ranchi

Fellows present

A K Sharma, President	A S Mukherjee
T N Khoshoo, Foreign Secretary	S K Mukherjee
A N Mitra, Editor of Publications	H L Nigam
G S Venkataraman, Editor of Publications	V S Rama Das
V S Arunachalam	G K Narayana Reddy
M V Bhatt	K K Rohatgi Mukherjee
K S Bilgrami	R P Roy
A K Bose	A K Saha
J S Datta Munshi	Y S R K Sharma
C J Dominic	S C Seal
J N Kapur	S P Sen
Abrar M Khan	Mrs Archana Sharma
Krishan Lal	A K P Sinha
D N Kundu	S Varadarajan
G K Manna	S K Joshi, Secretary
R S Mishra	P N Tandon, Secretary
R Misra	

The President wished the Fellows a Very Happy and Prosperous New Year. He referred to Professor R Misra receiving the Sanjay Gandhi Award and congratulated him on behalf of the Fellows of the Academy.

Condolence

The Fellows condoled the deaths of Professor B I Sundararaj, Dr D R Malhotra, Dr P K Bose, Professor Harish Chandra, Professor B R Puri and Professor K K Nanda, all present standing in silence for a minute as a mark of respect to the deceased.

Confirmation of the Minutes of the Annual General Meeting held on 1 October 1983

The minutes of the Annual General Meeting of the Academy held on 1 October 1983 read by Professor S K Joshi, Secretary, was confirmed.

Admission of Fellows Under Rule 13

The Fellows listed below introduced by those shown against their names were introduced to the Fellowship of the Academy. They signed the admission register and received their scrolls.

Name of the Fellows

Introduced by

Dr V S Arunachalam	Professor S K Joshi
Professor C J Dominic	Professor J S Datta Munshi
Dr Krishan Lal	Professor A N Mitra
Dr A S Mukherjee	Professor G K Manna
Professor (Mrs) K K Rohatgi Mukherjee	Professor H L Nigam
Professor Y S R K Sharma	Professor G S Venkataraman
Professor G K N Reddy	Professor H L Nigam

Scrutiny of Voting Papers for Amendment of Rule 14

Professor H L Nigam and Dr D S Bhakuni were appointed scrutineers by the Chairman.

The modification of the Obligation to be subscribed was declared carried having received more than 2/3rd of the valid votes polled in favour of the proposed change (see Appendix IV).

Scrutiny of Voting Papers for Amendment of Rule 19

Professor V S Rama Das and Professor S P Sen were appointed scrutineers by the Chairman.

The modification of Rule 19 exempting Fellows above the age of 60 from the payment of annual INSA subscription was declared carried having received more than 2/3rd of the valid votes, polled in favour of the proposed change (see Appendix V).

Presentation of the S H Zaheer Medal - 1983

The President informed the Fellows that the S H Zaheer Medal, 1983, was presented to Dr K V Suresh Babu, who was awarded the medal for his paper on 'Modelling and Simulation in Polymer Chemistry' presented at the 10th Anniversary General Meeting.

General Medal (the Meghnad Saha Medal) - 1984

The award of the General Medal (the Meghnad Saha Medal) 1984 to Dr Rao Ramanna, IAS, was announced.

INSA Albert Einstein Centenary Research Professorship

The award of the first INSA Einstein Centenary Research Professorship to Professor G N Ramachandran, FNA, was announced. The President delivered the anniversary address on "Additional Genes - Enigma in Biology."

Announcement of the Representation of the National Academy of Sciences, India, Nominated to the Council of the Indian National Science Academy for 1984

The nomination of Dr S Z Qasim, FNA, as the representative of the National Academy of Sciences, India, on the Council of the Indian National Science Academy for 1984 was announced.

Sd/
(P N TANDON) -
Secretary

Sd/
(A K SHARMA)
President

SCIENCE ACADEMY MEDALS FOR YOUNG SCIENTISTS—1985

Instituted by the Indian National Science Academy in 1974 these medals are awarded annually in recognition of outstanding work of scientists below the age of 32 (as reckoned on 31st December preceding the year of award). Only those born on or after January 1, 1953 are eligible for consideration in 1985. The work done in India by the nominee will be taken into consideration for the award.

With the medal there is a cash award of Rs. 5,000/-. In addition, the recipient is considered for a research grant by the Academy and also given preferential consideration under Travel grant scheme for attending international conferences.

Nominations for the awards for 1985 may be made by Fellows of the Academy, established scientific societies of all India character, University faculties and departments, or research institutions.

The last date for the receipt of nominations in the Academy is November 15, 1984.

Nominations received in previous year(s) *will not be carried forward*.

Nomination forms can be obtained from the Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi 110002 by sending a self addressed envelope of 28 cm × 12 cm size.

Indian National Science Academy

**Minutes of the Ordinary General Meeting of the Indian National Science Academy held at 6.30 p.m. on Wednesday,
18 January 1984 at INSA, New Delhi**

Fellows Present

A K Sharma—President
C N R Rao—Vice President
S Sriramachari—Vice President
V G Bhide—Treasurer
T N Khoshoo—Foreign Secretary
S C Agarwal
J C Ahluwalia
F Ahmad
S N Awasthi
S Banerjee
J Barnabas
K S Bhargava
I S Bhatia
P Bhattacharya
J C Bhattacharyya
S C Bhattacharyya
O P Bhutani
S S Bir
M N Bose
D P Burma
D Chakravorty
S R K Chopra
V L Chopra
A G Datta
B G Deshpande
G P Dutta
V K Gaur
J K Ghosh

A S Gupta
B M Gupta
S K Jain
M S Kanungo
R M Kasiwal
R N Lakhanpal
C K Majumdar
G K Manna
R C Mehrotra
R Misra
H Y Mohan Ram
N Mukunda
K Nagarajan
D Nasipuri
S C Pakrashi
B P Pal
Gopal Prasad
V Puri
L K Ramachandran
P S Ramakrishnan
S Ramanujam
S Ranganathan
P B L Rao
B R Rao
S R V Rao
R G Rastogi
Satya Prasad Raychaudhuri
R P Roy

N Ruedraiah
N S Satyamurthy
A G Sathyanesan
A B Sen
H G Sen
P Sengupta
J J Shah
Jagdish Shankar
(Mrs) Archana Sharma
G P Sharma
M M Sharma
V P Sharma
H N Siddiqui
O Siddiqi
B N Singh
J S Singh
V Singh
M S Sinha
B L K Somayajulu
R Sridharan
P N Srivastava
S Swaminathan
B S Trivedi
V V R Vardachari
W D West
S K Joshi—Secretary
P N Tandon—Secretary

Condolence

The Fellows condoled the passing away of Dr Brahm Prakash and Professor P N Ganapati, all present standing for a minute in silence as a mark of respect to the deceased.

Confirmation of the Minutes of the Anniversary General Meeting held on 2 January 1984

The minutes of the Anniversary General Meeting of the Academy held on 2 January 1984 in Bombay, read by Professor P N Tandon, Secretary, was confirmed.

Admission of Fellows under rule 13

Thirty Fellows listed below introduced by those named in round brackets were admitted to Fellowship of the Academy. They signed the register and received their scrolls.

Name of the Fellow

J V Narlikar
Brahm Prakash
S C Agarwal
D D Awasthi
Jagdish Banerjee
J C Ahluwalia
S R K Chopra
I S Bhatia
M N Bose
D Chakravorty
A G Datta
G P Dutta
Gopal Trivedi
A S Gupta
J K Ghosh
S M Jacob
R N Lakhanpal
C K Majumdar

Introduced by:

S K Joshi
U S Srivastava
S Sriramachari
Archana Sharma
Archana Sharma
C N R Rao
V G Bhide
F Ahmad
H Y Mohan Ram
C N R Rao
D P Burma
B N Singh
R Parthasarathy
R Parthasarathy
R Parthasarathy
Barnabas
H Y Mohan Ram
S K Joshi

Name of the Fellow

N Mukunda
 D Nasipuri
 S C Pakrashi
 V Rajaraman
 B L S Prakasa Rao
 V S R Rao
 H N Siddiquie
 J S Singh
 B L K Somayajulu
 S Swaminathan
 B S Trivedi
 V Singh

Introduced by

S K Joshi
 K Nagarajan
 P Sen Gupta
 C N R Rao
 K R Parthasarathy
 S Banerjee
 B G Deshpande
 Ramdeo Misra
 Anna Mani
 K Nagarajan
 S K Jain
 S K Joshi

Nominations received for Election to Fellowship Since the Last General Meeting

The names of Dr R V Chanthan and Dr S Krishnaswamy whose nominations were received for consideration for election to Fellowship of the Academy were read by the President.

At the conclusion of business, the President requested Fellows for their observations. The following suggestions were made:

- (i) More time be allocated to candidates for INSA Young Scientists, for presentation of their work.
- (ii) At the time of Annual Meeting or the Sectional Committee meetings seminars can be organised on suitable topics.

The above suggestions were noted and would be put up to the Council for consideration.

Sd/-

(P N TANDON)

Secretary

Sd/-

(A K SHARMA)

President

Appendix—I

INSA Endowment Lecture

Professor R K Asundi Memorial Lecture

(Founded out of an endowment of Rs 21,000/- by the Asundi Endowment Fund)

1. The Academy shall give once in two years alternating with Professor R. K. Asundi Memorial Lecture under the auspices of the different Local Chapters of the INSA by scientists known for their outstanding contribution in the field of spectroscopy. The first lecture will be delivered in 1984 (for which a separate sum of Rs 5,000/- has been received).
2. The lecture shall be given by rotation under the auspices of the different Local Chapters of the INSA. The candidates proposed for the lecture should play no role in selection for the award.
3. All Fellows of the Academy and Local Chapters shall be invited to suggest the name of two or three eminent scientists giving their bio-data and place of lecture. The Council at the meeting to be held in May shall select a suitable candidate out of this list. The name of the person selected by the Council for delivering this lecture shall be announced at the Annual General Meeting of the Academy in October.
4. The lecturer shall be paid a remuneration depending on the income from the endowment, besides travelling and halting expenses within India for journeys performed to deliver the lecture at the rate applicable to the members of the Council for attending meetings.
5. The lecturer shall deliver a lecture on a subject of his choice at a venue selected by the Academy. The lecturer shall submit, at least three months in advance, three copies of the lecture which shall be published by the Academy and over which the Academy shall have a copyright.

Appendix—II

Terms and Conditions of the Appointment of Architects for New Building :—

- (a) The concept of New Building with presentation drawings and model may be submitted by M/s. Raj Rewal Associates for 16th January 1984.
- (b) The Municipal drawings and other submission drawings shall be prepared by M/s Rajesh Arya & Associates.
- (c) Appointment of all the consultants shall be done by M/s Raj Rewal Associates and fees paid by Indian National Science Academy.
- (d) The detail working drawings and details shall be prepared by M/s Rajesh Arya & Associates.
- (e) The tender documents and invitation of contracts shall be done by M/s Raj Rewal Associates.
- (f) The supervision of works shall be carried out by M/s Rajesh Arya & Associates and bills filed be verified and checked every week by M/s Rajesh Arya and Associates and Time Certificate regarding the work shall be issued by M/s Raj Rewal Associates.
- (g) M/s Rajesh Arya & Associates requested that Mr Arya or their representatives shall be present in all the discussions and meeting of INSA and other consultants.
- (h) Indian National Science Academy agreed to the following Professional fees:

1. Total Fees	: 4.5%
2. M/s Raj Rewal Associates	: 1.75%
3. M/s Rajesh Arya & Associates	: 1.40%
4. Consultant	: 1.35%
- (i) Mr Raj Rewal requested the Academy to prepare the requirements and the programme for the New Building.
- (ii) It was agreed that M/s Raj Rewal Associates would be prime consultants and M/s Rajesh Arya & Associates would be Associate Architects.
- (iii) It was agreed by the presentee that the work should start immediately.
- (iv) It was agreed that some terms and conditions shall follow for Phase I and Phase II of the New Building.
- (v) It was also decided that one project engineer may also be appointed by INSA who would work alongwith the Architects and one works Assistant will be appointed for the New Building to work with Architects.
- (vi) It was left that the cost of the project would be about Rs 22½/- to 250/- per sq feet.

Regulations Regarding INSA Golden Jubilee Biren Roy Trust Fellowship

Name of the Fellowship	The Fellowship shall be known as the INSA Golden Jubilee Biren Roy Trust Fellowship
Source of Fund	The Fellowship is founded in the Year 1984 from a proposed endowment of Rs 2 lakhs from the Biren Roy Trust, Behala, Calcutta. The Trust has asked the State Bank of India, on maturity to hand over the amount of Rs 2 lakhs to the Academy for investment, the return to be used for the purpose of Fellowship. A separate sum of Rs 30,000/- has been received in the Academy for the Fellowship to be awarded for the year 1984-85.
Objective	The Fellowship shall be awarded to a scientist in recognition of outstanding contributions in Physics and/or Nuclear Science or Aeronautics. The objective of the Research Fellowship is to provide an opportunity to such scientists who wish to pursue a career of research unfettered with other responsibilities which go along with most other permanent teaching or research positions.
Eligibility	The main criterion for the selection of the candidate shall be merit. The award shall be made only to persons resident or domiciled in India.
Value and Duration	<p>The INSA Golden Jubilee Biren Roy Trust Research Fellowship will be tenable for a duration of two years at the first instance extendable, if necessary, or for a period as the Council may think fit. The Fellowship shall carry an award of Rs 2,500 per month. A grant of Rs 10,000 per annum will be made for contingency expenditure. Only one Fellowship will continue at a time. The Research Fellow shall be attached to a suitable institution (giving full consideration to the preference indicated by the selected Research Fellow).</p> <p>The institution shall provide working facilities and secretarial help. Provident Fund contribution of the scientist selected for the fellowship may be paid by the Academy if his/her parent organisation does not agree to pay it.</p>
Mode of Selection	In awarding and renewing the INSA Golden Jubilee Biren Roy Trust Research Fellowship, the Council of the Academy may be assisted by an Advisory Committee appointed for the purpose. The Advisory Committee may obtain confidential opinion of appropriate expert referees and any other information to make recommendations to the Council. Nominations will be invited from Fellows of the Academy, Heads of Research Institutions, and Deans of Faculties of Physics, Nuclear Physics and Aeronautics of Universities. Nominations may also be invited by open advertisements.
Announcement of the Fellowship	The name of the scientist selected for the Fellowship by the Council shall be announced at the Annual General Meeting of the Academy to be held in October.
Conditions governing the INSA Golden Jubilee Biren Roy Trust Research Fellowship	<p>(a) The Research Fellow selected by the Council shall state the general nature and scope of proposed research alongwith an undertaking from the Institution to which he/she wishes to attach him/her self, that the necessary facilities would be made available.</p> <p>(b) The Research Fellow shall normally devote his/her whole time to research and shall not accept or hold any appointment paid or otherwise, other than his fellowship without the written permission of the Council. The Council will be prepared to consider a request by a research Fellow to undertake at the university/institution where he/she is working, approved teaching work that does not involve more than three hours duration per week.</p> <p>(c) During the tenure of Fellowship the research Fellow shall not seek any employment without prior permission of INSA. He/she shall also not resign the Fellowship except with the prior approval of INSA. In case he/she resigns without obtaining prior approval before completing the tenure of the Fellowship or the extended period of Fellowship he/she will be liable to refund to the Academy the full amount drawn by him/her as Fellowship. For this purpose he/she shall execute an obligation in the prescribed form before joining.</p> <p>(d) If the Research Fellow commits a breach of any term or condition of appointment, or becomes, in the opinion of the Academy neglectful, unfit or unable to pursue research or is found guilty of conduct unbecoming of the holder of INSA's research Fellowship, the Academy shall have power to terminate the Research Fellowship, with or without notice as the circumstances of the case may warrant.</p> <p>(e) All patents, rights, designs and inventions derived from the research work of the Fellow funded or aided by the Academy shall belong to the Indian National Science Academy or its nominee, but the Academy may, at its discretion, allow or direct any benefit in part or full thereof, to be retained by or given to the Research Fellow.</p> <p>(f) The Research Fellow shall present to the Academy a yearly report of his/her work. He/she shall submit, at the end of the fellowship, also forward a comprehensive report together with a summary.</p>

- (g) At the termination of the Fellowship, the Fellow shall hand over all material including unperishable stores and equipment left over out of purchases made from the contingency allotted to the head of the laboratory where he/she was working as an INSA Golden Jubilee Biren Roy Trust Research Fellow.
- (h) These regulations may be revised or amended by the Academy at any time.

Appendix—IV

Amended rules 14 and 19

Rule 14

"Every person elected a Fellow of the Academy shall, before his admission, subscribe the obligation in the following words:

As a Fellow of the Indian National Science Academy I shall follow the code of scientific ethics, maintain integrity in research and publications, uphold the cause of science and the dignity of the Academy, endeavour to be objective in my judgement, and strive for the enrichment of human values and thoughts."

Rule 19

The subscription of Fellows shall be Rs 36 per year. Fellows who became Non-Resident before 1950 will continue to pay Rs 16 per annum according to old Rule. In the case of a Fellow, who is a member of some other Science Academy or Academies in India working in co-operation with the INSA in accordance with the regulation for co-operating Academies, a reduction of Rs 12 annually, shall be allowed on the full subscription of Rs 36 on the evidence of a certificate from a co-operating Academy, provided that in subsequent years, he himself certifies that he continues to be a member of a co-operating Academy.

Such Fellows as have already paid their subscription for 30 years will be exempted from further payment of subscription.

Fellows above the age of 60 may be exempted from the payment of the annual INSA subscription.

INDIAN SCIENCE CONGRESS ASSOCIATION
14, Dr Biresh Guha Street,
Calcutta-700017

ANNOUNCEMENT

AWARDS UNDER ISCA YOUNG SCIENTISTS PROGRAMME

Indian Science Congress Association introduced the programme for the benefit of young scientists from the 68th Session of the Science Congress in January, 1981. The programme enables young scientists to present their proposed research work with opportunities to exchange ideas in the relevant scientific problems with their counterparts and specialists. The details of the programme are given below:

- (i) Only members of the Association are eligible for consideration for the Award;
 - (ii) The upper age limit for the Award is 30 years as on January 1 of the session;
 - (iii) The papers to be presented for consideration shall have to be:
 - (a) under single authorship, (b) preference will be given for independent work preferably at the post-doctoral level, and (c) the work must have been carried out in India.
- One copy of the full paper alongwith three copies of its abstract in 100 words (to be clearly indicated on the top of the first page of the full paper and on the top of all the three copies of the abstracts the section where it is desired to be presented) shall have to reach the office of the General Secretary (Headquarters) not later than August 16 preceding the Session. Biodata, including full name and address alongwith the date of birth (duly supported by attested copy of the certificate), research experience, list of publications should be given in the top sheet of the complete paper;
- (iv) The papers/abstracts will be scrutinised and the scientists will be required to present their papers in respective sections, if invited by the Sectional Presidents concerned;
 - (v) The names of awardees will be announced by the General President at the meeting of the General Committee. The Certificate of Merit and the Cash Award of Rs 500/- will be handed over to the recipient with the citation. A further amount of Rs 2,500/- towards incidentals, etc. will be sent to the awardees later from the headquarters of the Association. The total number of Awards are twenty; and
 - (vi) The young scientists as recommended by the concerned sections will be provided with the admissible travelling and daily allowances by Indian Science Congress Association (second class concessional bothways rail fare and daily allowance of Rs 35/-per day not more than 10 days).

ALBERT EINSTEIN : Selections from and on Einstein, INSA & CSIR. 1984

In October, 1979 a special issue of Science Information Notes in mimeographed form on 'Albert Einstein' containing some select quotations and articles from and on Einstein was issued to mark his centenary. In view of the persistent and continuing demand for this number, the Academy has recently brought out its revised version in collaboration with the CSIR. Besides Seminars/Summer Institutes, this publication is intended for restricted distribution amongst the Fellows of the Academy who may especially ask for a copy. This publication (171 pages) is available without charge. In case you wish to obtain a copy, please send your request to the *Executive Secretary, Indian National Science Academy New Delhi-110 002.*

PUBLICATIONS OF THE NATIONAL COMMISSION FOR THE COMPILATION OF HISTORY OF SCIENCES IN INDIA

Indian Journal of History of Science

First issued in 1966. Periodicity : Bi-annual

Annual Subscription (inclusive of postage) : Rs. 30.00 (inland); £3.00 or \$8.00 (foreign).

Single issue : Rs. 20.00 (inland); £2.00 or \$5.50 (foreign).

Books

<i>A Bibliography of Sanskrit Works on Astronomy and Mathematics</i> by S. N. Sen	Rs. 20.00; \$5.00
<i>Fathullah Shirazi—A Sixteenth Century Indian Scientist</i> by M. A. Alvi and A. Rahman	Rs. 2.50; \$0.33
<i>Jahangir—The Naturalist</i> by M. A. Alvi and A. Rahman	Rs. 20.00; \$3.60
<i>Charaka Samhita</i>	Rs. 30.00; \$10.00
<i>Susruta Samhita</i>	Rs. 108.00; \$36.00
<i>Bibliography of Source Materials on History of Science and Technology in Medieval India</i> by A. Rahman et al.	Rs. 200.00; \$70.00
<i>Bibliography of the Works of Abul-Raihan-Al-Biruni</i> Compiled by Ahmad Saced Khan	Rs. 30.00 \$10.00
<i>The Sulbasutras</i> by S. N. Sen and A. K. Bag	Rs. 85.00; \$28.50

AVAILABLE INSA GOLDEN JUBILEE RELEASES

	Rs. P.
1. <i>Fellows of the Indian National Science Academy (Past and Present)</i> <i>Biographical Notes</i>	110.00
2. <i>Antarctica (The Unknown Continent of Unexplored Wealth)</i> S. Z. Qasim and L. U. Joshi	7.50 20.00
3. <i>Nutrition and Brain</i> —P. N. Tandon and G. Gopinath	8.00
4. <i>Solid State Chemistry</i> —C. N. R. Rao	4.00
5. <i>Liquid Crystals</i> —S. Chandrasekhar	6.00
6. <i>Perspectives in Organometallic Chemistry</i> —R. C. Mehrotra and G. Srivastava	7.50
7. <i>The Monsoons—A Perspective</i> —P. K. Das	5.00
8. <i>Rice in 2000 AD</i> —M. S. Swaminathan	25.00
9. <i>Environmental Chemical Mutagenesis</i> —Archana Sharma	6.00
10. <i>Basic Building Blocks Began (...) Big Bang</i> —A. N. Mitra	
11. <i>Science in India—Changing Profile</i> Edited by S. K. Mukherjee, FNA and B. V. Subbarayappa	20.00 350.00
12. <i>Addresses by Presidents (1935-1984) of INSA</i>	500.00
13. <i>INSA Medal Lectures</i> (Set of 2 volumes)	7.00
14. <i>The Dharwar Craton</i> —C. S. Pichamuthu and R. Srinivasan	7.00
15. <i>Perspectives in Organic Synthesis</i> —G. Mehta and M. Nagarajan	5.00
16. <i>Mathematical Model of Environment</i> —J. N. Kapoor	

PUBLICATIONS OF THE ACADEMY

(For details please contact Associate Editor, INSA)

Proceedings

Part A (*Physical Sciences*), **Part B** (*Biological Sciences*)

First issued in 1935 as a single volume for both branches, split into two series in 1955.

Periodicity : Monthly (six issues of each part in a year)

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